Birds of the Three Kings Islands

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The field notes and collections upon which this paper is based are mainly the result of four recent visits to the Three Kings group: the Auckland Museum Expedition in H.M.N.Z.S. "Arbutus" from 30th November to 6th December, 1945, which included G. A. Buddle, P. C. Bull, and R. A. Wilson; the Department of Internal Affairs Expedition from 13th April to 16th May, 1946, accompanied by E. G. Turbott; and two brief visits in January, 1947, and December, 1947-January, 1948, by G. A. Buddle and M. E. Johnson. The longer of these expeditions visited only Great Island, but on the two last, landings were achieved on the forbidding outliers, North East and South West Islands. We are grateful to all these observers for co-operation in preparing this account, in a number of cases notes being quoted directly over initials. The Museum is indebted to the Hon. Minister of Internal Affairs for permission to collect a small number of specimens on Great Island.

There have been few accounts of the birds of the Three Kings since T. F. Cheeseman visited Great Island in August, 1887, and both Great Island and South West Island in November, 1889 (Cheeseman, 1888 and 1891; Smith, 1887).

From 12th to 15th December, 1928, W. M. Fraser was a member of Lady Alice Fergusson's party camping on Great Island and recorded brief observations on the birds (Fraser, 1929).

A more recent visit was on 20th and 21st February, 1934, when the Auckland Museum Expedition in the auxiliary yacht "Will Watch," including R. A. Falla, W. R. B. Oliver, C. A. Fleming and E. G. Turbott, landed on Great Island. We are grateful to Dr. R. A. Falla for checking references to this visit, and for the opportunity to refer to his manuscript for this series (Falla, 1948).

ECOLOGICAL AND DISTRIBUTIONAL NOTES.

The Three Kings Islands lie thirty-five miles beyond the northern point of New Zealand. Precipitous coasts, strong tidal currents and the heavy swell of the Tasman Sea all contribute to the inaccessibility of the group. The islands lie east and west in a serrated line, Great Island, approximately 1,000 acres in area, being flanked by two much smaller members, North East and South West Islands; westwards again, the rocky chain of the Princes Islands terminates in a third, and as yet unexplored outlier, West Island.

The four larger islands were originally richly clothed in mixed coastal or semi-coastal forest (Baylis, 1948); and North East, South West and West Islands are still covered, except on the most rocky cliffs, by dense forest and scrub. The vegetation of Great Island forms a

marked contrast, having undergone profound changes during early Maori settlement and later as the result of the influence of goats (Baylis, ibid.)

In 1946, when the goat population was exterminated, the plant covering of Great Island consisted almost entirely of a uniform forest composed of *Leptospermum ericoides* A. Rich. (kanuka), the monotony of which was scarcely broken by a few scattered, large-leafed trees. This *Leptospermum* forest was open and park-like, being almost devoid of undergrowth, but on the forest floor sedges, grasses, and herbs formed a dense mat broken at intervals by patches of short, dry turf. The only part of the island not invaded by *Leptospermum* forest was a comparatively small area of grassland and adjoining wind-swept prostrate *Leptospermum* scrub on the southern slopes of Tasman Valley.

The deep-seated effect of these environmental modifications upon the birds of Great Island is discussed elsewhere (Turbott, 1948). The impoverishment of the vegetation by goats is considered to have been the primary factor contributing to the present low population densities of all the endemic land birds except one abundant species, *Anthornis melanura* (Turbott, 1940 and 1948). Competition by nine species of naturalised passerine birds which have reached Great Island is not regarded as of marked effect, nor is the influence of the two predatory species, *Ninox novaeseelandiae* and *Circus approximans*.*

Great Island would appear (Turbott, 1948) to have supported originally a much richer land bird fauna. Some species must have become extinct during Maori occupation, and others more certainly during the period when goats progressively reduced the vegetation. Re-establishment of these species from the mainland, although in most cases within their possibilities of dispersal, had apparently been impossible on account of the modification of the plant covering. The following species are believed with reasonable certainty to have occurred formerly on the island: *Bowdleria punctata*, *Pseudogerygone igata* and *Prosthemadera novaeseelandiae*, listed from Great Island by Cheeseman (1888) in 1887; and *Cyanoramphus auriceps*, recorded during the "Will Watch" Expedition in 1934. In addition, *Cyanoramphus novaezelandiae* appears to have suffered a considerable population decrease since the latter visit.

Changes in the vegetation and direct trampling and disturbance by goats are believed to have influenced the extent and location of breeding colonies of petrels and of *Larus novaehollandiae* (Turbott, 1948).

It will be evident from this brief reference that, as regeneration of the vegetation proceeds, study of the birds of Great Island will be of the greatest interest, especially as regards the possibility of modification in habits and population densities, and of recolonisation by species from the mainland.

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* Naturalised predatory mammals are absent from the Three Kings.

The land bird fauna of the group, as known from historical and recent accounts, evidently closely resembles that of the mainland; but endemism has developed in *Anthornis melanura,* described as a distinct subspecies by Falla (1948), and may be incipient in a mutant element which we record in discussing the population of *Rhipidura fuliginosa.*

As a breeding centre for sea birds in this region the Three Kings are of major significance: *Pelecanoides urinatrix, Puffinus gavia, Pterodroma macroptera, Morus serrator* and *Larus novaehollandiae* all breed on the group in large numbers. An unexpected addition to the list of sea birds breeding on Great Island is *Pterodroma hypoleuca nigripennis,* of which a small breeding colony was discovered during the "Arbutus" Expedition in 1945. The range of this species is thus further extended, Falla (1942) having identified skins from Lord Howe Island as of this species.†

Breeding seasons. Bull (1946) has referred to the breeding season of *Turdus merula* as observed on Great Island in November-December, 1945, remarking that slightly later breeding dates distinguish this species on Little Barrier and the Poor Knights, as well as on the Three Kings. This is attributed to the necessarily more shaded habitat on such islands, which are covered by bush or scrub. Bull further suggests that this species may have a relatively late breeding season in forest habitats elsewhere in New Zealand, as indicated by observations in the Rotorua district.

During the "Arbutus" Expedition the possibility of a general retardation of the breeding season on the Three Kings became evident. This is indicated by later breeding dates for sea birds—*Larus novaehollandiae, Pelecanoides urinatrix* and *Puffinus gavia*—as compared with observations on the Mokohinau group in the same year, and on the Poor Knights in 1940 (Buddle, 1941, 1946, 1947; Fleming, 1946).

Further research would be of value on the breeding seasons of both land and sea birds on northern offshore islands.

SYSTEMATIC LIST.

Eudyptula minor (Forst.) (little blue penguin).

Great I.: The blue penguin has not been recorded as breeding, but rock crevices in North West Bay were found to contain feathers on 21st February, 1934, probably where the birds had come ashore to moult.

Pelecanoides urinatrix (Gm.) (diving petrel).

Great I.: Fraser (1929) describes "two fairly large colonies" and records a half-feathered chick found under a box above South East Bay (12th-15th December, 1928); this record being listed by Oliver (1930) and mentioned by Falla (1934). In November-December, 1945, the diving petrel was found nesting in considerable numbers on the eastern coast and in Tasman Bay. In November, 1945, two burrows were found, each with an adult or an egg (P.C.B.) but otherwise the burrows commonly contained chicks in dark grey down. In April-May, 1946, a

† Previously recorded breeding on the Kermadec and Austral groups.

few diving petrels were coming in, generally silently, at night with the other petrels; and were observed offshore in twos and threes. **South West I.:** Buddle (1948) records young in burrows on 3rd January, 1947.

Pelagodroma marina (Lath.) (white-faced storm petrel).

Great I.: This must be regarded as a tentative addition to the breeding list, on the evidence of a leg found in a nest of *Ninox novaeseelandiae* on 1st December, 1945. This species was seen off West Island on 6th December, 1945 (G.A.B.).

Puffinus carneipes Gould (flesh-footed shearwater).

Recorded from the Three Kings by Oliver (1930), and stated to be probably breeding by Falla (1934); but not found during recent visits. Flesh-footed shearwaters were observed offshore in considerable numbers on 31st December, 1947; particularly near the still unexplored West Island (G.A.B.).

Puffinus bulleri Salvin (Buller's shearwater).

Falla (1934) considers it extremely probable that Buller's shearwater breeds on the group: it has been observed commonly offshore during all recent expeditions, one being recorded as late as April, 1946 (E.G.T.), but breeding has still to be recorded.

Puffinus griseus (Gm.) (sooty shearwater).

Great I.: Falla (1934) records this species as breeding: an adult was found in a burrow above North West Bay on 21st February, 1934. On 3rd December, 1945, one was seen on the ground at night (P.C.B.); and a well-fledged young shearwater found in a burrow on 14th April, 1946 and described by M. Chaney was probably of this species. As on other northern offshore islands, the Three Kings breeding population is probably small.

Sooty shearwaters were observed off West Island on 6th December, 1945 (G.A.B.).

Puffinus gavia (Forst.) (fluttering shearwater).

Great I.: This was found to be the commonest breeding petrel during recent expeditions. It is recorded from the Three Kings by Falla (1934): empty burrows and a dead specimen were found on Great Island and the birds heard at night over North West Bay, 20th-21st February, 1934. In November-December, 1945, the fluttering shearwater was found nesting on many parts of the island, occurring in the greatest numbers above the eastern and northern coasts, and in Tasman Bay. Of those examined at this time at least half contained chicks. The incoming birds were particularly noisy, their staccato calling being continuous from about 8.30 p.m. They were observed squatting, sometimes in pairs, outside the burrows (P.C.B.). In April-May, 1946, this species was still coming in, although the young would have departed towards the end of January (Falla, ibid.). It would thus appear to visit the breeding stations for some months after the young have left, in this habit resembling *Puffinus assimilis* and *Pterodroma macroptera* (Fleming and Serventy, 1943); like these two species the fluttering

shearwater is non-migratory. **South West I.:** Buddle (1948) describes many burrows containing young on 3rd January, 1947. **North East I.:** Young were found on 4th January and 31st December, 1947 (G.A.B.).

Puffinus assimilis Gould (allied shearwater).

Great I.: On 1st December, 1945, freshly-vacated burrows were examined above Tasman Bay, feathers and the size of the burrows suggesting that they were of this shearwater. **South West I.:** Cheeseman (1891) states that a specimen (? adult or young) was taken from a burrow among roots of *Meryta sinclairii* (Hook. f.) Seem. (puka) in November, 1889. The bird was apparently not collected, there being no specimen with these data in the Auckland Museum. Fleming and Serventy (1943) regard as doubtful Mathews' reference (1934) to this species from the Three Kings, which is listed by Oliver (1930). It seems possible, in view of the discovery of *Puffinus gavia* on the same island, that Cheeseman's identification may have been in error, although the presence of an adult allied shearwater ashore in November is comparable with Major R. A. Wilson's record on Hen Island (Falla, 1934; Fleming and Serventy, 1943).

Pterodroma macroptera (Smith) (grey-faced petrel).

Great I.: The grey-faced petrel nests in considerable numbers; records of breeding behaviour on the Three Kings corresponding closely to Falla's general account of this species (1934). On 29th-30th November, 1945, two nests examined each contained a fully-fledged chick; and a few adults were seen on the ground at night (P.C.B.). In April-May, 1946, this was the principal petrel coming in, making a dramatic landfall in erratic flight especially on the saddle between North West Bay and South East Bay. Calling began before dark, particularly on clear nights, the birds being seen circling close overhead shortly after 6 p.m. On cloudless nights they were quite silent by 9.10 p.m., but on overcast nights or in rain were heard until much later. Calling was accompanied by chasing flights. On 19th April, 1946, several burrows examined during the day contained single birds or pairs. **South West I.:** Buddle (1948) records fully fledged young on 3rd January, 1947; a number of unoccupied burrows were considered to be of this species. **North East I.:** Many burrows, apparently of this species, were unoccupied on 30th December, 1947 (G.A.B.).

Pterodroma hypoleuca nigripennis (Rothschild) (black-winged petrel).

Great I.: This record of the black-winged petrel within New Zealand was made by Mr. P. C. Bull on 3rd December, 1945. At the eastern point of the island shortly after sunset, Mr. Bull saw medium-sized petrels with white underparts by torchlight, but none were observed to land until about 9.30 p.m. Their flight was most erratic, frequently with chasing in pairs. A shrill piping and a moaning note were produced in the air, but on the ground only a croaking note. Altogether, at least twelve pairs were observed and others heard in the same area.

The discovery was made just before the end of the visit, so that no further observation was possible.

Mr. Bull's field recognition of these birds, together with the following live measurements* of eight individuals, leave no doubt as to the identity of this petrel: (in m.m.)

No.	Sex	Locality	Date	Wing	Tail	Tarsus	Toe	Culmen
A	—	Great I., Three Kings	3/12/45	226	101	32.5	37	24
B	—	Great I., Three Kings	3/12/45	230	105	33	38	24
C	—	Great I., Three Kings	3/12/45	223	103	33	36	25.5
D	—	Great I., Three Kings	3/12/45	230	107	33	39	24
E	—	Great I., Three Kings	3/12/45	228	107	32	38	25
F	—	Great I., Three Kings	3/12/45	227	106	32	38	24
G	—	Great I., Three Kings	3/12/45	227	107	32	37	24
H	—	Great I., Three Kings	3/12/45	230	106	31	37	25
AM. 137.2	♀	Kermadec Is.	—	228	103	29	37	25
137.3	—	Curtis I., Kermadecs	Nov. 1890	228	104	28.5	36	23
137.4	♀	Kermadec Is.	19/2/09	230	104	30	35	24
137.5	♀	Kermadec Is.	9/1/09	228	106	29	35	23
137.6	♂	Kermadec Is.	Jan. 1909	228	104	30	37	23.5
137.7	—	Curtis I., Kermadecs	Nov. 1890	224	100	30	36	24
137.8	♀	Kermadec Is.	—	223	103	33	39	24 5
137.15	♂ imm.	Curtis I., Kermadecs	16/4/29	205	103	32	38	25
137.16	♂	Kermadec Is.	19/2/09	226	102	31	36	23.5

Mr. Bull's field notes include the description of the feet as "pale vinaceous grey, outer toe and distal half of web and remaining toes black." Photographs were taken in the field by G. A. Buddle.

On the Kermadecs Oliver (1930) describes this petrel as being first heard late in October and coming ashore to clean the burrows in mid-November; the eggs are laid in late December and early January. These dates correspond with Mr. Bull's observations of behaviour, including mating flights, in early December. The opportunity may be taken to note that on 4th December, 1907, G. A. Buddle found a pair ashore in an empty burrow on Curtis Island of the Kermadec group.

On 19th April, 1946, small burrows examined in the eastern area of Great Island had apparently been recently vacated, containing white feathers, eggshell and much nesting material; in some cases the burrow entrance appeared to have been recently scraped (E.G.T.). These burrows, if of the present species, would correspond to Oliver's record of the departure of the young on the Kermadecs in April. It is of interest that two immature specimens in Auckland Museum were collected on Curtis Island of the Kermadecs by A. T. Pycroft on 16th April: A.M. 137.15, tabulated above, is fully fledged with down still adhering to the neck, and A.M. 137.14 is a well-feathered chick with much down remaining on the underparts and scattered dorsally. Mr. A. T. Pycroft informs us that both were collected in the burrow. Undiscovered burrows on Great Island may still have contained young at this stage on 19th April.

* As Fleming (1941) states, culmen length is essentially the same in live birds and dry skins, other dimensions not requiring any significant reduction.

The discovery of the black-winged petrel on the Three Kings during the "Arbutus" Expedition is mentioned in an editorial paragraph in "New Zealand Bird Notes" (vol. 2, p. 11), with reference to a photograph published in the "Auckland Weekly News."

Pterodroma sp.

Characteristic "ti-ti" calls of some species of gadfly petrel, as distinct from any sound known to be made by *Pterodroma h. nigripennis*, were heard regularly on Great Island in November-December, 1945. The calls appeared to come from one or two birds flying above the peak eastwards from the depot.

Phalacrocorax varius (Gm.) (pied shag).

This species was recorded somewhat indefinitely offshore in April-May, 1946; on 3rd January, 1948, three were seen (G.A.B.) in flight between Great and South West Islands.

Morus serrator (Gray) (gannet).

A full account of gannet colonies on the Three Kings as observed on 3rd-6th January, 1947, has been published by G. A. Buddle (1947). The population is a large one, being given on the basis of combined estimate and count as 3,750 birds. Of these, 750 are regarded as being from South West Island, where 250 nests, eggs and young were counted, and the remainder from four members of the Princes Islands.†

The colony on the south-eastern point of South West Island was examined in November, 1889, by Cheeseman (1891), who describes gannets and red-billed gulls together as numbering "thousands." The gannet colony was inshore from that of the gulls and of much larger extent; eggs were just beginning to hatch, and plenty of young were seen, at the slate-coloured stage and without down.

It is difficult from Cheeseman's description to judge whether any change has occurred in this colony since 1889, although his general statement of numbers and area would suggest that the colony has decreased considerably. Buddle (1947) gives reasons for believing that it is expanding at present into the neighbouring scrub.

In April-May, 1946, gannets could be seen from Great Island still in occupation of the South West Island colony.

Sterna striata Gm. (white-fronted tern)

This species was seen offshore in November-December, 1945, but has not been recorded as breeding on the group.

† G. A. Buddle (*New Zealand Bird Notes*, 3, 40; 1948) summarises observations made on South West Island and the Princes on 1st January, 1948. Closer and more detailed observation indicates that the total population of gannets is probably c. 5,500. Some of the smaller isolated colonies had increased in size since January, 1947.

Larus novaehollandiae Steph. (red-billed gull).

The Three Kings form perhaps the largest breeding station in New Zealand for the red-billed gull. Cheeseman (1891)‡ in his account of South West Island refers to a nesting colony of thousands, and Fraser (1929) estimated tens of thousands breeding in many separate colonies on Great Island, more especially above South East Bay (12th-15th December, 1928). Fleming (1946) mentions the major proportions of the colonies as indicated by observations during the "Will Watch" Expedition; during this expedition (20th-21st February, 1934) breeding was still in progress at South East Bay, Crater Head and on the eastern coast. **Great I.:** Some of the many colonies round the cliffs examined in detail during the "Arbutus" Expedition from 30th November to 6th December, 1945, included c. 300 above Tasman Bay, and c. 500 nests on the east coast. Of 100 nests counted on 3rd December in the latter colony, one contained three, 67 two, and 32 one egg; four or five empty nests were counted (P.C.B.). No young were seen during this visit. In April-May, 1946, flocks were seen feeding offshore, but the nesting areas were now completely deserted. Considerable numbers in immature plumage were found dead, 20-30 being counted in one day on the western portion of the island. **South West I.:** Buddle (1947, 1948) describes a large colony of several thousands, corresponding to Cheeseman's description, at the south-eastern end of the island on 3rd January, 1947, less than one per cent of the eggs having hatched on this date. The adults were feeding on the fruits of *Meryta sinclairii*, a habit referred to by Baylis (1948) in describing the regeneration of the vegetation on Great Island. **Princes Is.:** Large colonies existing on these rocks are described by Buddle (1947, 1948).

This species does not breed on North East Island and West Island (G.A.B.).

On 21st February, 1934, vast massed flocks of this gull, with *Puffinus gavia*, swirled about the "Will Watch" to the north of the group (Falla, 1934); smaller flocks have been seen feeding offshore in November-December-January during recent visits.

Larus dominicanus Lich. (black-backed gull) has never been recorded, although it is common on the nearby mainland. Murphy (1936) states that this gull seems to be particularly dependent upon local conditions in its breeding range in South America. The combination of rigorous littoral conditions and competition by other species may make for an unsuitable habitat on the Three Kings.

Hypotaenidia philippensis (L.) (banded rail).

Great I.: One specimen, A.M. 57.42, an adult male, 4/12/45, is not different from mainland specimens. The banded rail is recorded by Fraser (1929), who recognised the call. It has been observed on subsequent visits, being apparently sparingly distributed over the whole island. It feeds in the open forest, amongst the sedges and other ground vegeta-

‡ Cheeseman mentions that fresh eggs were eaten by the crew of the "Hinemoa" (November, 1889).

tion. A pair, or possibly three, were constantly seen near the depot in April-May, 1946; two calls familiar on the mainland, a purring note and a sharp pipe, were heard.

Porzana tabuensis (Gm.) (spotless crake).

Great I.: The crake was recorded during the "Arbutus" Expedition, being glimpsed doubtfully, and heard on one occasion. On 18th April, 1946, during shooting, one was seen clearly near the western cliffs, being frightened from cover in low scrub and sedge; it gave a high-pitched alarm note as it ran across an open space (E.G.T.). **South West I.:** Buddle (1948) on 3rd January, 1947, found this species fairly plentiful and discovered one empty nest.

The ecological requirements of these two species of rail on offshore islands are difficult to determine. *Hypotaenidia philippensis* would appear to have replaced *Porzana tabuensis* under the open *Leptospermum* forest of Great Island; and predominates on Tawhiti Rahi of the Poor Knights group, where both are present (Buddle, 1946). This species is absent from Aorangi of the same group, but here *Porzana* is common, a fact believed by Buddle (1941, 1946) to depend partly upon the abundance of the native grass *Microlaena polynoda* Hook. f., which provides a favoured nesting site. On South West Island *Porzana* is a breeding species, possibly with a similar relationship to the ground vegetation. Apart from a nesting association with the vegetation, *Porzana* would appear to thrive on smaller islands with a dense covering of forest of scrub; while any considerable modification as on Great Island, or on Tawhiti Rahi, of which a small part has been burned, is apparently favourable to *Hypotaenidia*. The powers of dispersal of rails in general are such that the distribution of these species on northern offshore islands must depend upon factors other than geographical.

Porphyrio poliocephalus (Lath.) (pukeko).

Great I.: A skeleton of an adult with feathers still attached, A.M. 64.42, was found above Tasman Bay on 28th April, 1946. This species is a straggler to the Kermadecs (Oliver, 1930) and to Lord Howe Island (Hindwood, 1940).

Synoicus sp. (brown quail).

Great I.: The following four skins are in the Auckland Museum:

No.	Sex	Date	Wing	Tail	Tarsus	Toe	Culmen
A.M. 890.10	ad. ♀	30/11/45	100	50	22.5	27	broken
890.11	ad. ♂	30/11/45	99	50	22	27	14
890.15	ad. ♂	14/ 5/46	97	47	24	27	15
890.16	ad. ♀	14/ 5/46	99	48	23	26	14

The measurements, colour of soft parts, and plumage characters of this small sample correspond to those of brown quail at present occurring near Auckland.

We have at the suggestion of Dr. R. A. Falla left open the identity of quail on the Three Kings until further investigation has been carried out. We are indebted to Dr. Falla for permission to refer to his sug

gestion that before the introduction of *Synoicus ypsilophorus* (Bosc.) from Australia, an indigenous *Synoicus* may have existed in the northern New Zealand region, including the offshore islands (see Thomson, 1922; Buddle, 1941, 1946). The indigenous quail may itself have been a subspecies of *Synoicus ypsilophorus*.

Both *S. y. ypsilophorus* and *S. y. australis* (Lath.) were released near Auckland between 1867 and 1871 (Thomson, 1922), and could conceivably have reached the Three Kings by the time of Cheeseman's visit in 1887; furthermore, it seems probable that brown quail from the mainland at present regularly reach at least the nearer offshore islands (Turbott, 1947).

Cheeseman (1888 and 1891) first recorded the quail on Great Island, referring it to *Coturnix novaezealandiae* Q. & G. on field identification. It was not regarded as common, only three being seen in 1887 and 13-14 in 1889. Cheeseman's record in 1887 is mentioned by Buller (1888). In November, 1889, a "beautifully-made, cup-shaped nest" containing six fresh eggs was found: these were brought back for the Auckland Museum, but are not now in the collections; one was given to Buller, who recognised it as "not that of our New Zealand Quail, but of *Synoecus australis*, the Brown Quail of Australia, which has been introduced into New Zealand, and is now extremely plentiful in all parts of the country" (Buller, 1905).

Fraser (1929) found the quail, which he referred to as *Coturnix novaezealandiae*, on every part of the island, and saw young not long hatched, 12th-15th December, 1928. It is interesting that the call is described by Fraser as "whe-whi," a good rendering of the common call of *Synoicus ypsilophorus*. Oliver (1930) subsequently referred quail on the Three Kings to *Synoicus australis* (Lath.).

On recent visits the quail has been found to be quite common. It occurs in small flocks on the open forest floor, probably obtaining abundant insects and fruits of grasses and sedges. The drawn-out call described by Fraser is heard frequently, and a sparrow-like chirping given when flying away upon being disturbed. Two nests containing nine and fifteen eggs respectively were found on 2nd and 5th December, 1945; and newly hatched chicks were seen on 3rd December.

Circus approximans Peale (harrier).

Great I.: Cheeseman (1888), Oliver (1930); noted as absent by Fraser (1929). A few have been observed on all recent visits, including a record by Johnson (1946). On 1st December, 1945, a nest containing four eggs was found on a platform of wind-swept *Leptospermum*.
South West I.: Cheeseman (1891) discovered a nest containing fledglings nearly full grown. One was seen circling the summit on 3rd January, 1947 (G.A.B.).

Ninox novaeseelandiae (Gm.) (morepork).

Great I.: Cheeseman (1888), Fraser (1929), Oliver (1930). The morepork is in moderate numbers; food is plentiful, comprising mainly brown geckos (*Hoplodactylus spp.*) and numbers of *Anthornis melanura*, remains of which were found near the nests (P.C.B.). Three

nests were discovered on 1st December, 1945, the first containing two newly-hatched chicks, the second fully-fledged young, and the third an infertile egg and young bird half grown. The situation was in all cases on the ground, under cover of a cavelet or at the base of a hollow tree. Crevices in inland rocks were common daytime roosting places; both "more-pork" and scream, the common calls on the mainland, were heard. **South West I.:** Several were seen by Cheeseman (1891); not recorded on 3rd January, 1947 (G.A.B.).

Cyanoramphus novaezelandiae (Sparrm.) (red-fronted parakeet)

Great I.: Two skins in the Auckland Museum have the following data and measurements:

A.M. 42.20, 20/2/1934, male (immature?), wing 134, tail 141, tarsus 19, toe 25, culmen 18.

A.M. 42.21, 20/2/1934, female (immature?), wing 124, tail 123, tarsus 19, toe 25, culmen 14.

Recorded by Cheeseman (1888); Fraser (1929); Oliver (1930). This parakeet was regarded as moderately plentiful during the "Will Watch" Expedition in 1934. On recent expeditions, including a visit by M. E. Johnson on 1st January, 1945 (Johnson, 1946), it has been observed only occasionally, and would certainly appear from general observation to have decreased in numbers (E.G.T.). Its breeding habits have not been observed on the group. **South West I.:** Buddle (1948) refers to numbers representing an established population, January, 1947. **North East I.:** A pair was recorded by Buddle (1948) in January, 1947.

Cyanoramphus auriceps (Kuhl) (yellow-fronted parakeet).

This species, which occurs on the larger islands—Hen Island and Little Barrier Island—off the northern coast, was seen on Great Island on 20th February, 1934, close to the castaway depot. One bird was observed closely, and another at some distance; one being recorded again on the following day. The longer periods in 1945 and 1946 would have ensured observation of this species, but it must be regarded as extinct on the island (Turbott, 1948).

Eudynamis taitensis (Sparrm.) (long-tailed cuckoo).

Great I.: Not more than one or two recorded in February, 1934; and again in December, 1945.

Halcyon sanctus V. & H. (kingfisher).

Great I.: Two adult male skins, A.M. 29.54 (22/4/46) and 29.55 (13/5/46) fall within mainland series except that in A.M. 29.54 the collar is white. In a series of this species from the mainland in the Auckland Museum the collar ranges from deep buff to pale with only a faint buff wash. The specimen, A.M. 29.54, is referred to in the discussion of *Rhipidura fuliginosa* below. Cheeseman (1888); Fraser (1929); Oliver (1930). The kingfisher occurs only in small to moderate numbers, although it is seen frequently throughout the island. Burrows were found in December, 1945, on the banks of the Tasman Stream, one containing five eggs. **South West I.:** Recorded on 3rd January, 1947 (G.A.B.).

Anthus novaeseelandiae (Gm.) (pipit).

Great I.: Cheeseman (1888); Fraser (1929); Oliver (1930); Johnson (1946). The pipit is fairly common, inhabiting the rocky seaward faces along the shore, the grassy slopes and scrub of Tasman Valley and, as an additional niche characteristic of this island, the more open parts of the *Leptospermum* forest (Turbott, 1948). It is absent only in groves of mixed forest and tall *Leptospermum* in the deeper Tasman Valley. A nest with four eggs was found on 1st December, 1945. **South West I.:** Buddle (1948) observed a pair in January, 1947, on the grassy summit plateau (G.A.B.).

Bowdleria punctata (Q. & G.) (fern-bird).

Listed from Great Island by Cheeseman (1888); Oliver (1930). This species is now absent; it may well have been an inhabitant of tussock and shrubland on Great Island, resembling in this respect fern-birds of the Snares and the Chatham Islands. Cheeseman (1888) records it only in a list, and may possibly have identified it from call alone; in this case the record may be regarded with some doubt. This species is at present common in scrub and fern country on the adjacent mainland (Watt, 1947).

Pseudogerygone igata (Q. & G.) (grey warbler).

Listed by Cheeseman (1888 and 1891) from Great Island and South West Island; Oliver (1930). On South West Island Cheeseman found the grey warbler comparatively scarce. It is now absent on Great Island and apparently also on South West Island (G.A.B.) (Turbott, 1948). It is plentiful on the neighbouring mainland (Watt, 1947).

Rhipidura fuliginosa (Sparrm.) (fantail).

The following are data and measurements of three skins in the Auckland Museum*:

A.M. 17.26: 5/12/45, Great Island; wing 72, tail 90, tarsus 19.5, toe 13, culmen (broken).

A.M. 17.27: 11/5/46, adult ♂, eastern division of Great Island; wing 73, tail 92, tarsus 19, toe 14.5, culmen 8.5.

A.M. 17.28: 12/5/46, adult ♂, Tasman Valley, Great Island; wing 76, tail 101, tarsus 19, toe 15, culmen 8.

These measurements, and colours of soft parts, show no difference from mainland specimens.

A.M. 17.26 and 17.27 are distinguishable from all "pied" *Rhipidura fuliginosa* from the mainland which we have examined by a particularly wide and distinct band of white-tipped feathers between the black foreneck and the buff underparts; and from freshly moulted mainland specimens by the paler colour of the under surface, which is a yellowish buff.

A.M. 17.28 cannot be separated from mainland specimens, having no white breast band, although there are a few feathers tipped with pale buff along the lower edge of the black foreneck. The under surface in this specimen is a rich warm buff.

* See Appendix.

In a considerable proportion of our mainland series of "pied" *Rhipidura fuliginosa*, a more or less distinct line of pale buff-tipped feathers delineates the lower edge of the black foreneck, generally affecting not more than two rows of feathers. The character occurs at random in these specimens, collected chiefly in Auckland and Nelson, and remains distinct although the colour of the adjacent under surface may be obscured by seasonal fading or wear.

We note that Mayr (1931) describes as follows the seasonal plumage changes in *Rhipidura fuliginosa brenchleyi* Sharpe, which are probably applicable to all forms of *Rhipidura fuliginosa*: freshly moulted birds are stated to have the underside tinged with a warm ochraceous-buff which bleaches to pale buff later in the season, while the upperside gets a brownish tinge due to wear. It seems probable from the series which we have examined that, apart from this seasonal fading, the depth of colour in the buff underparts varies considerably in this species on the mainland.

Of the specimens from Great Island, both A.M. 17.27 and 17.28 collected in May proved to have well-developed testes (in A.M. 17.28 measuring 1.5 x 1 mm.); and neither shows any sign of moult, wear or fading. In A.M. 17.26, obtained in December, the tail feathers are worn at the tips, so that the under surface might by this time of the year have begun to fade.

Our conclusion as regards these specimens from Great Island is that A.M. 17.26 and 17.27 are mutants, being distinguishable from *Rhipidura fuliginosa* of the mainland by the distinct white band on the upper breast and pale under surface; and that A.M. 17.28 represents an element in the population conforming in colour characters to the mainland range. Unfortunately the necessarily few specimens available are not sufficient to indicate the numerical status of the mutant.

According to our estimate the numbers of this species on Great Island are at present not more than fifty. As indicated above, the population has been subjected to modification of the habitat since early Maori settlement, but to a marked degree for approximately fifty years during which modification by goats is known to have been in progress (Turbott, 1948). Under these conditions, the occurrence of a well-established mutant would be significant as dependent upon the "Sewall Wright effect," whereby small isolated groups of a hundred individuals or less tend towards genetic homogeneity. In such populations mutations may become established by accident alone as true non-adaptive differences (Mayr, 1942; Lack, 1947; Turbott, ms.).

It seems possible that in *Rhipidura fuliginosa* on Great Island the mutant may be replacing the normal phase, in which case the population could be regarded as having reached a stage in subspeciation. *Rhipidura fuliginosa* would appear to be essentially sedentary, although, as Mayr and Moynihan (1946) have shown with reference to *Rhipidura rufifrons*, fantails are capable of widespread dispersal over long periods of time, their apparently weak powers of flight being most deceptive. "Normal" characters may thus have become re-established in this essen-

tially isolated stock through occasional influx from the mainland population. On the neighbouring mainland the fantail is at present plentiful (Watt, 1947).

The mutant of *Rhipidura fuliginosa* and *Anthornis melanura* subsp. nov. (Falla, 1948) are both characterised by the replacement of coloured plumage markings by white; and the same trend towards loss of colour occurs in a single specimen of *Halcyon sanctus* already described. Murphy (1938) draws attention to the difficulty of accounting for cases of convergence in size or colour, which may affect practically all the endemic birds on certain islands.

The call note of fantails on Great Island has been recorded independently by several observers as markedly sharper and more strident than on the mainland. As Falla (1948) indicates with reference to *Anthornis melanura,* insular populations tend to have a distinct song. Further research into the diagnostic value of voice characters in such cases would be of interest.

The fantail was recorded on Great Island by Cheeseman (1888); by Fraser (1929); and listed by Oliver (1930). On 20th February, 1934, during the "Will Watch" Expedition young birds were still readily distinguishable.

South West I.: Cheeseman (1891), "comparatively scarce"; not recorded on 3rd January, 1947 (G.A.B.).

Zosterops lateralis (Lath.) (silvereye).

Great I.: Cheeseman (1888); Oliver (1930). The silvereye has not been recorded during recent expeditions, except on 6th May, 1946, when a flock of 10 to 12 was observed. It seemed evident that these had come from the mainland, their appearance coinciding with a wind change to the south-west, following upon a prolonged period of stormy weather from the east. They may well have been survivors of a larger flock blown westwards from the narrowly attenuated adjacent mainland during the storm; this species is here particularly common (Watt, 1947) and would at this time of the year be moving about in large winter flocks.

The members of the flock observed on Great Island were obviously agitated and particularly noisy, appearing to traverse the island haphazardly without feeding. They were first seen at mid-day, two or three being observed almost simultaneously by members of the party scattered over the island, and the full flock noted together in the evening. They remained on the island until at least 12th May (E.G.T.).

In view of this observation, the possibility arises that Cheeseman's record also refers to stragglers, although, as suggested elsewhere (Turbott, 1948), it was quite probably breeding on Great Island before the vegetation had been modified to its present state.

South West I.: Cheeseman (1891) also records the silvereye, noting that it was apparently comparatively scarce. It was not observed during the brief visit on 3rd January, 1947 (G.A.B.) (Turbott, 1948).

Prosthemadera novaeseelandiae (Gm.) (tui).

Great I.: Cheeseman (1888); Oliver (1930); Johnson (1946) in error (Turbott, 1948). Cheeseman's record of the tui seems likely to be definite, and this species must be added to the list of birds which have become extinct comparatively recently, with the continued modification of the vegetation. On the far northern mainland it occurs only as a straggler (Turbott, 1948).

Anthornis melanura (Sparrm.) (bellbird).

Great I.: Cheeseman (1888 and 1891); Fraser (1929), "plentiful"; Oliver (1930); Johnson (1946); Falla (1948), subsp. nov. The bellbird is by far the commonest land bird and has been thus noted by Cheeseman and subsequent observers. We would estimate it as outnumbering every other species at present by at least ten to one. The male is of particularly distinctive plumage, with almost black mantle and white markings (Falla, ibid.). Nesting was over by November-December, 1945, but young birds not long out of the nest were quite common. Its diet must be predominatingly insectivorous, although *Metrosideros excelsa* Gaertn. (pohutukawa), and a few other nectar-bearing trees would provide a modicum of sweet substance. In May, 1946, in Tasman Valley, bellbirds were feeding from flowers of the rare bignoniaceous liane endemic to the group (Oliver, 1948). This plant was in abundant flower, and a dozen or more bellbirds were in the neighbourhood, singing in mellifluous chorus and fighting amongst the flowers hanging in rich creamy-green clusters (E.G.T.). In addition to the melodious song described by Falla (1948), both sexes have the same harsh call note, pitched a little higher in the female. **South West I.:** Cheeseman (1891) notes this species as abundant. Buddle (1948) records it as fairly plentiful in January, 1947; and makes the interesting observation that the plumage pattern is the same as on Great Island. **North East I.:** Six were seen by Buddle (ibid.) in January, 1947.

Fringilla coelebs L. (chaffinch).

Great I.: The chaffinch is present in small numbers, breeding on the island. An old nest was found in November-December, 1945, when on several occasions the full song was heard (P.C.B.).

Carduelis cabaret (P. L. S. Mull.) (redpoll).

Great I.: This species was observed in April-May, 1946, but only in flocks at some distance (E.G.T.).

Carduelis carduelis (L.) (goldfinch).

Great I.: The goldfinch was seen in April-May, 1946, only at some distance; the numbers present were small (E.G.T.).

Passer domesticus (L.) (house sparrow).

Great I.: A flock of c. 10 including males and females came close about the camp towards the end of the visit in April-May, 1946 (E.G.T.); approximately the same number were seen in 1945 (G.A.B.).

Emberiza citrinella L. (yellowhammer).

Great I.: Although seen a number of times in April-May, 1946, this species is not common; a flock of three observed closely were young birds or females (E.G.T.).

Turdus ericetorum Turt. (song thrush).

Great I.: Song was heard in the evenings in November-December, 1945; and a nest with four eggs was found (P.C.B.). A few thrushes were seen in April-May, 1946 (E.G.T.).

Turdus merula L. (blackbird).

Great I.: This species was recorded on 20th February, 1934. On subsequent visits it has been found to be fairly common, outnumbering all indigenous land birds except *Anthornis melanura*. The full song was heard throughout the day, except at noon, at the end of November and in early December, 1945; nests with eggs (one recorded contained four) were found on 1st and 5th December (P.C.B.). **South West I.:** Recorded as numerous by Buddle (1948), who found several nests containing young on 3rd January, 1947. Buddle refers to the possibility of competition for food on the forest floor between this species and *Porzana tabuensis*, following his earlier reference to a similar relationship between these two species on the Poor Knights (Buddle, 1941, 1946; Turbott, 1948). **North East I.:** Recorded by Buddle (1948).

Prunella modularis (L.) (hedge sparrow).

Great I.: Hedge sparrows were seen several times in April-May, 1946, in *Leptospermum* shrubland about the castaway depot and by other members of the party elsewhere; a couple in immature plumage were seen in tall *Leptospermum* on the eastern part of the island (E.G.T.). The invasion of the area north of Auckland by this species is comparatively recent, having occurred within the last fifteen years. Watt (1947) refers to it as having been present for approximately ten years in the farthest north.

Sturnus vulgaris L. (starling).

Great I.: The starling was observed by the "Will Watch" party in 1934 and has been recorded subsequently in fair numbers on all parts of the island, and particularly about the cliffs. Flocks of 20-30 were seen in 1946. **South West I.:** In January, 1947, Buddle (1948) saw several flocks. **North East I.:** Small flocks on the same date (Buddle, ibid.).

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APPENDIX.

On 6th October, 1948, an Auckland Museum party, including the writers, landed for four hours on Great Island. We are grateful to Mr. A. J. Black, of the motor vessel "Alert," for providing this opportunity to examine the island.

The following land birds were recorded during this brief visit: *Synoicus* (brown quail), *Circus approximans* (harrier), *Cyanoramphus novaezelandiae* (red-fronted parakeet), *Rhipidura fuliginosa* (fantail), *Zosterops lateralis* (silvereye), *Carduelis carduelis* (goldfinch) and *Turdus merula* (blackbird). *Anthus novaeseelandiae* (pipit) was observed both in *Leptospermum ericoides* forest and on the grassland of Tasman Valley.

Sterna striata (white-fronted tern) was recorded, several calling as they passed over the island.

Burrows examined on the slopes above South East Bay proved to contain *Pelecanoides urinatrix* (diving petrel) and *Puffinus gavia* (fluttering shearwater) sitting on eggs; by 7.20 p.m. considerable numbers of diving petrels were circling close inshore above the landing.

The presence of *Zosterops lateralis* is of particular interest, several small flocks being recorded. These may have been stragglers, or may indicate a small population breeding on the island during the present season.

It would seem unlikely that the early stages in regeneration of the vegetation, to which reference is made by Baylis and by Turbott in this series, would yet have influenced the status of *Zosterops lateralis* or other land birds.

Through the courtesy of the Hon. Minister of Internal Affairs, a specimen of *Rhipidura fuliginosa* was collected during this visit. This skin, A.M. 17.30, from the neighbourhood of the castaway depot, has mutant plumage characters as in specimens which we have described; the tail feathers are much worn, and the under surface is probably correspondingly faded. Measurements: wing 70, tail 89, tarsus 18, toe 13, culmen 8 mm.